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LEARNING OUTCOME IMPROVEMENT OF THE STUDENTS FROM SMA USING MULTIMEDIA

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Abstract: This research aims to increase the ability of students to understand and improve the learning outcome of chemical analysis in chemistry and also to improve the ability of teachers to deliver the subject. This research was conducted at SMA Angkasa Halim Perdana Kusuma di Jakarta. This research is a classroom action research which was done in 2 cycles for as long as 5 months by using two observers in the school. This is an ongoing research which is at the phase of data collection. The expected hypotheses are after watching the video or interactive software about chemical analysis, students will understand the material which is shown by happy attitude and test result improvement.

Keywords: software, multimedia, chemistry, electrochemistry

INTRODUCTION

Background

Curriculum of 2013, which is an operational curriculum arranged and conducted in each educational entity nowadays, expects every teacher to improve and have his/her own ability to arrange the suitable curriculum for the students.

Chemistry is one of subjects considered difficult by students nowadays. As result, many High School students are not success in learning chemistry. Chemistry, is the most difficult subject and have become scourge for them.

Research conducted by Pendley, Bretz and Novak (1994) showed that students generally learn by memorizing, not by actively searching to build their own understanding towards the chemistry concept. Nakhleh (1992) also stated that the memorizing method caused some chemistry concepts were abstract for students. They even couldn't recognized key concepts not relation between concepts needed to understand the concept. Therefore, in order to understand concepts in chemistry, correct understanding towards basic concept which builds the concept.

In reality, Natural Sciences subject, including chemistry nowadays, always taught by drilling students to memorize without giving understanding towards the concept itself for the sake of final score target (Hadiat, 1994). As result, students couldn't build understanding towards fundamental chemistry concepts when they learned chemistry.

In learning chemistry, many obstacles are faced by the students as well as teachers in giving the learning materials. Starting from the limitation of equipment and materials used, the concept which is

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theoretical and microscopic, until the experiments that are dangerous because of the physical and chemical properties that accompany the chemicals and experimental results that are done.

The role of learning model, strategy and methodology used by the teacher in explaining the learning materials to the students greatly affect their interest and motivation in understanding the concept of chemistry. Sometimes our students are more affected by the teaching style and the readiness of the teacher in delivering the materials rather than the content of the chemistry subject itself. However in this case, it is important for a teacher to prepare, plan, deliver, and evaluate materials so that students like the chemistry subject in which all depends on the presentation of the material given by the teacher.

As teachers, we certainly do not want our students to not want or less interested to study a subject that they really need in the future just because of incompatibility issues in the way teachers deliver the material. Studying is basically an effort to direct the students into the learning process so that they acquire the learning objectives according to the expectation.

The learning process should pay attention to the students' individual condition because they are the ones who will learn. Students are different individuals with one another, having uniqueness that are each different from the other. Therefore, learning should pay attention to the difference in individual, so that learning can really change the condition of students from not knowing to knowing, from not understanding to understand, from unskilled to skilled, and from less behaved to well behaved.

One of the topics that need to be explained in the chemistry syllabus is chemical analysis. In learning chemistry which related to chemistry calculation, chemical analysis is a way that pictured all quantitative aspects of chemical composition and substance chemical reaction.

Substance It self is a matter which was composed from particles, atoms, and molecules with certain kind and comparison; whereas relative substance mass (*Mr*) equals to its relative atom mass which composed it.

Example of chapter in chemical analysis which was often found is the one with mathematical calculation. If joint atom formed chemical substance (element molecule, compound molecule, ionic molecule), then it is total of the atom mass. The sub-chapters, for example, are determining relative molecule mass and relative mass formula (*Mr*), mole concept, chemical calculation in chemical equation, etc.

Theoretically, the chemical analysis description above is difficult to understand because student needs correct imagination is needed to understand the concept. Therefore, a representative method is needed to assist students. One of the methods is computer-based multimedia learning or ICT.

The choice of multimedia learning method is expected to increase the study results of students, therefore this classroom action research needs to be done to know whether there is an increase in the students learning outcome to the learning material of the chemical analysis.

Theoretical Background

Learning activity is a main activity in the whole activity and education process in school. This means that the success or failure of the achievement of educational goals largely depend on the learning process experienced by students. Therefore, every teacher should understand

well about the learning process of students and the methodology used to present the learning materials so that teachers can give guidance and provide the proper and harmonious learning environment for the students.

Learning with Interactive Multimedia

According to von Glaserfeld, learning is, as quoted and good thinking is more important than having a good way of thinking, this means that the way of thinking can be used to face new phenomena, will be able to find solution in facing other problems. Students who only find the correct answer may not necessarily be able to solve new problems possibly because they do not understand how to find the answer.

Briggs (1977) wrote that learning media (such as book, film, video, etc) was a physical instrument to deliver learning material. Learning is not an activity to transfer knowledge from teacher to student, but an activity that allows the students to build their own knowledge. Learning means the participation of teachers with students in the form of knowledge, making meaning, looking for clarity, be critical, and conducting justification. Study conducted showed that student had more learning options and challenges by animation and interactive method using online chemistry learning modul compared to static modul that was used before. However, there was factor that became consideration from this investigation. It was a good understanding from students about chemistry. This should be done in various chemistry-understanding level to obtain better conclusion.

Therefore, learning is a form of independent learning. Interactive multimedia is a media that consists of teaching materials loaded with programming language which commonly use ***power point*** or ***flash***. Interactive Multimedia has several types;

a. Drill and Practice
   This type gives instructions through drill and opportunity to measure ability through test, this type is usually used to increase the basic knowledge.
b. Tutorial
   In this type, computer replaces teacher or tutor. This type presents information, asks question and gives response (feedback).
c. Simulation
   Simulation type is used to present or imitate real situations.
d. Games
   This type is suitable to train the user to make fast decisions in solving problems that are offered as competition, challenge, strategy setting, and others.

Classroom Action Research

Classroom Action Research (CAR) is a kind of learning that have a classroom context which are implemented by teachers to solve learning problems faced by teacher, fix the quality and study result, and try new learning for the sake of quality and result improvement.

Based on the quantity and behavioral traits of the members, CAR can be in the form of individual and collaborative, which can be called as individual CAR and collaborative CAR. In individual CAR, the teacher conduct CAR in their own class or other class, while in collaborative CAR, several teachers synergically conduct CAR in their own class and between members performing classroom visits.

CAR has a number of characteristics as followed (Sumarni, e.a., 2016):

1) Cyclical, which means that CAR looked as cycles (planning, give action, observation, and reflection), as concrete research procedure.
2) Longitudinal, which means that CAR should take place in a certain time frame (for example 2-3 months) continuously to obtain the required data, not finished in “one shot”.
3) Particular-specific so does not intend to do generalization in order to obtain theories. The results are not for generalization though perhaps implemented by other people in other place that have the similar context.
4) Participatory, in the meaning of teacher as the researcher as well as the agents of change and target that needs to be changed. This means that the teacher has double roles, which is as the researcher as well as the object of research.
5) Emic (not ethic), which means that CAR views learning from the people inside which are not distanced with the object of research; not based on the point of view of the people outside who are distanced with the object of research.
6) Collaborative or Cooperative, which means that the implementation of CAR always occur by collaboration or working together between the researchers (teacher) and other parties for the validity and achievement of research objectives.
7) Casuistic, which means that CAR works on specific or particular cases in learning which are real and affordable by the teacher; working on big problems.
8) Using the natural classroom context, which means that class as the area of implementation of CAR, it does not need to be manipulated and/or engineered for the needs, importance, and the achievement of research objectives.
9) Prioritize the sufficiency of data needed to achieve research objectives, not the representation number of samples quantitatively. Because of that, CAR only demands the use of simple statistics, not complex.
10) Intend to change reality, and learning situations to become better and meet expectations, not intending to build theory and test hypothesis.

The objective of CAR is as followed:

1) Fix and improve the quality of education practices implemented by teachers in order to achieve learning objectives.
2) Fix and improve learning performances implemented by teachers.
3) Identify, find solution, and overcome learning problems in class for quality education.
4) Improve and strengthen teachers’ ability in solving learning problems and making the right decisions for students and classes taught.
5) Explore and produce creations and innovations in education (such as approach, method, strategy, and media) that can be done by teachers for the quality improvement of process and study results.
6) Try out ideas, thoughts, tips, ways, and new strategies in teaching to improve education quality other than the innovative abilities of teacher.
7) Explore education that is always insightful and based on research so

that education can focus on the empirical reality of class, not only focus on general impression or assumption.

The four main steps that are interrelated in the implementation of classroom action research are often called as one cycle (Winter & Brodd, 2004). Then, visually the stages in every cycle can be described in Figure 1.

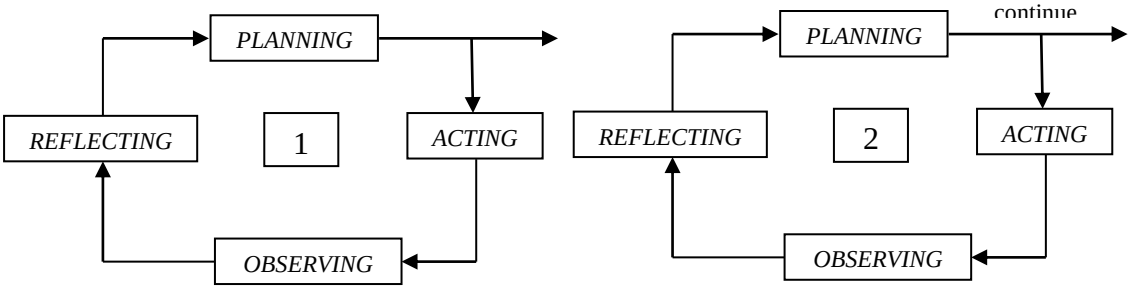

Figure 1. Classroom Action Research Cycle Model

In implementing actions or corrections, observations and interpretations are done simultaneously. So that the implementation of action is according to the rules of CAR, these six criteria need to be applied:

1. Research methodology should not disturb the teachers' commitment as the implementer of education.
2. Data collection should not waste too much of the teachers' time.
3. Methodology should be reliable so that teaches can implement the appropriate strategy with the class situation.
4. Problems addressed by the teachers should be in accordance with the ability and commitment.
5. Teachers should pay attention to several rules (ethics) connected to their assignment.
6. CAR should receive support from the school community. (Aqib, 2007)

Electrochemistry

through the separation of oxidation and reduction reactions from a redox reaction to electrical energy or vice versa. Electrochemistry includes **Voltaic Cells, Standard Potential Cell, Corrosion, Anode – Cathode, Electrolysis Cell uses Faraday's Law**.

For example :

Galvanic Voltaic Cells discussing about the spontaneous redox reaction and generate electricity.

The anode is the electrode where the oxidation reaction occurs

The cathode is the electrode where the reduction reaction occurs

Framework of Thinking

In explaining electrochemistry, it needs basic understanding about anode cells and cathode cells (Cheng, Liu, & Logan, 2006). Anode and cathode cells are electrodes in the form of plates or bars that carry electric current to the electrolyte or vice versa (Kjelstrup, e.a., 2013).

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METHOD

The research was conducted in SMA Angkasa Halim, East Jakarta in class XII (twelfth grade) by involving two observers (chemistry teacher and principal or element

of leadership) in the school. The expected indicator of success is that first the students are able to be active and interact with the interactive multimedia program so that they can understand the concept of electrochemistry correctly. The second indicator is the ability of students to describe and picture the concept of electrochemistry by observing the illustration from the interactive multimedia program based on the correct concept of electrochemistry. The third indicator is that the ability of students in answering questions and solving given problems improved which indicated by the objective test results that are improving in cycle 2 compared to cycle 1.

The plan of this classroom action research was that this research was done in 2 cycles in which in each cycle, the success level is adapted with competence, which is hoped to be mastered by the students after the learning process. Before the cycles, the students went through the assessment phase in which the students are tested to measure the initial ability owned by the students and explore the problems faced by the students which are linked with the competence desired.

In the first cycle, the researcher along with observer (teacher) dug up the problems and difficulties faced by the teacher in increasing the students' interest and study results to the electrochemistry which was continued with the discussion regarding the students' initial test result to determine the action plan to the problem. The determined action plan was to guide by teaching and learning, delivering the material, describe and explain the display in interactive multimedia, discussion, and test. The first cycle was done in 2 study hours or 2 x 45 minutes. The first 45 minutes was done with the teacher conducting learning activities and one of the researchers giving interactive software material about chemical bonding by using interactive multimedia, while the next 45 minutes was done by discussion with the teacher's guidance to explore thoughts about the understanding of the material shown in LCD. Monitoring was done during the whole learning process by using observation technique and recording, which includes incidents, change in behavior, ways, and documentation technique towards situation and condition in class; and also given questions and problems need to be solved. The monitoring data was then analyzed which aimed to know the scenario to be prepared and done based on the competence. Therefore, the researcher can reflect the weakness or strength in the first cycle and minimize it in the second cycle. The data and media of collection are described in Table 1.

Table 1. Data and Media of Collection

Data	**Media of Collection**
Participative observation result	Observation Sheet /Observation
Observation of class activity	Observation Sheet
Measurement of study result	Test Result Sheet

The second cycle was done based on the analysis and reflection result from cycle 1, which is from how the result and weakness of steps from the first cycle, what effects and changes should be done in the second cycle. With this, the action steps in the second cycle should also be the same as the first cycle, only the materials delivered are the same but by adding the treatment such that the students are grouped in 4 groups by **Mind mapping** and each group are given assignments to reflect back on what they saw and understand from the interactive learning media. Mind mapping is a technique commonly used for learning material in a school or campus environment.

Visuals created in a mind map can help you organize the information you just received and determine the big themes in the discussion.. The students were then asked to present their discussion results in concept mapping as interesting as possible so that it is easy to understand. Each student from every group were split and form new groups such that the new group consists of members from every different groups. Teachers also usually use this method so that students or students can understand the material presented in a comprehensive manner. Each member explains what was understood from their initial group so that every student has the same understanding. In the end of the learning process, students are also obliged to do the test similar to the first cycle.

RESULT

This research has been completed and the data obtained are sufficiently accurate. The first hypothesis for this research is that after watching the video or interactive software about electrochemistry, students understand with the material which is shown by happy attitude and increasing test result.

The second hypothesis is after watching the video or interactive software about electrochemistry properties, students understand the material, which is shown by the discussion result between students from different groups who are excited and make the report of observation result and video observation or software completely and detailed. The third hypothesis is that the students' written objective test result in the form of multiple choice and essay has an increase in grade result in cycle 2 compared to cycle 1. The implementation schedule of the 5-months research is described in Table 2.

Table 2. Details of Research Schedule

DETAILS OF	MONTH				
ACTIVITY	1	2	3	4	5
1. Preparation	√	√			
2. Implementation of Cycle I			√		
a. Action Scenario			√		
b. Implementation of Action, Observation and Interpretation			√		
c. Data Analysis dan Reflection			√		
3. Implementation of Cycle II				√	
a. Action Scenario				√	
b. Implementation of Action, Observation and Interpretation				√	
c. Data Analysis dan Reflection				√	
4. Making the report duplication and sending the result of research					√

CONCLUSION

The action was conducted with 2 cycles. There was improvement in 31 students' learning result in class X.A1 from average score of 54.96 to 61.61. Before the action was conducted, the average score was only 43.68. There was significant increase after the ICT was implemented. As previously explained, mind mapping can help you understand a concept or material as a whole. After creating and seeing the results, it will be easier for you to understand and relate one concept to another. From the research result, there was significant increase from students' learning result using ICT. Therefore, teachers was suggested to use ICT variously and effectively to motivate student to learn more intensive. For student, the use of ICT –though it looked complicated and complex—will make learning atmosphere more variative and fun

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